

1   **Claims**

2   1. A protective cosmetic particulate gel delivery system for a topically applied  
3   active agent comprising discrete gel particles formed of an agar gel and  
4   further comprising a restraining polymer dispersed in the agar gel, the  
5   restraining polymer having sufficient molecular weight to prevent egress of the  
6   restraining polymer from the agar gel, having retention groups to bind the active  
7   agent to the restraining polymer for retention in the gel particles and being  
8   present in a proportion sufficient to deliver an effective amount of the active  
9   agent wherein the gel particles are manually crushable on the skin to increase the  
10   surface area of the gel particle material and expose the restraining polymer to the  
11   skin or other body surface for release of the active agent.

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13   2. A cosmetic particulate gel delivery system according to claim 1 comprising  
14   active agent molecules bound to the restraining polymer retention groups  
15   wherein the restraining polymer has an average molecular weight of at least  
16   100,000 daltons.

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18   3. A cosmetic particulate gel delivery system according to claim 2 wherein the  
19   active agent and the retention groups both comprise polar groups and are of  
20   opposite polarity whereby the active agent can bind ionically with the retention  
21   groups.

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23   4. A cosmetic particulate gel delivery system according to claim 4 wherein the  
24   restraining polymer is a water-soluble modified polysaccharide and the retention  
25   groups are quaternary ammonium substituent groups.

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27   5. A cosmetic particulate gel delivery system according to claim 1 wherein the  
28   active agent and the retention groups both comprise lipophilic groups whereby  
29   the active agent can bind lipophilically to the retention groups.

1 6. A cosmetic particulate gel delivery system according to claim 1 wherein the  
2 restraining polymer is selected from the group consisting of polyquaternium 24,  
3 laurdimonium hydroxyethylcellulose, cocodimonium hydroxyethylcellulose,  
4 steardimonium hydroxyethylcellulose and mixtures thereof.

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6 7. A cosmetic particulate gel delivery system according to claim 1 wherein the  
7 active agent is selected from the group consisting of antioxidants, botanically  
8 derived polyphenols, procyanidin oligomers, free radical scavengers, topically  
9 active enzymes, antibacterials, glucose oxidase, antioxidants, superoxide  
10 dismutase, proteolytic enzymes, bromelain, DNA repair enzymes, exfoliative  
11 retinoids, retinol, retinol esters, retinol acetate, vitamin A palmitate, purified  
12 plant extracts, plant proteins, whitening agents, arbutin, essential fatty acids,  
13 linoleic acid, linolenic acid, arachidonic acid, animal proteins, collagen, elastin,  
14 keratin, moisturizers, hyaluronic acid, glycosaminoglycans, ultraviolet light  
15 filters, ultraviolet light absorbents, coated and uncoated organic and inorganic  
16 pigments, titanium, zinc, and iron oxides, melanin, sepia ink extract, colorants,  
17 dyes and perfumes.

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19 8. A protective cosmetic particulate gel delivery system for a topically applied  
20 active agent comprising discrete, self-supporting gel particles of from 50 microns  
21 to 10 mm average size, substantially insoluble in water at 25 °C and formed of a  
22 polymeric gel and further comprising a restraining polymer dispersed in the gel,  
23 the restraining polymer having sufficient molecular weight to prevent egress of  
24 the restraining polymer from the agar gel, having retention groups to bind the  
25 active agent to the restraining polymer for retention in the gel particles and being  
26 present in a proportion sufficient to deliver an effective amount of the active  
27 agent, wherein the gel particles are manually crushable on the skin to increase  
28 the surface area of the gel particle material and expose the restraining polymer to  
29 the skin or other body surface for release of the active agent.

1 9. A method of preparing agar gel particles comprising the steps of:  
2 a) dissolving agar in water heated to an elevated temperature sufficient to  
3 dissolve the agar, in a proportion of agar to water effective to form a gel at  
4 lower temperatures; and  
5 b) mechanically dispersing the agar solution in a cold hydrophobic liquid  
6 immiscible with the agar solution maintained at a temperature below the  
7 agar gelling point;  
8 comprising including a water-soluble restraining polymer in the agar solution  
9 whereby the drops are formed into gel beads incorporating the restraining  
10 polymer.

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12 10. A method according to claim 9 wherein comprising cooling the hot agar  
13 solution to an intermediate temperature above the gelling point of the agar  
14 solution prior to performing step b).

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16 11. A method according to claim 9 wherein the agar-restraining polymer  
17 solution is mechanically dispersed in the cold hydrophobic liquid by using a  
18 rotating agitator.

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20 12. A method according to claim 11 comprising selecting the rotation speed of  
21 the agitator to obtain a desired gel bead size.

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23 13. A method according to claim 9 wherein the agar-restraining polymer  
24 solution is mechanically dispersed in the cold hydrophobic liquid by injection  
25 through a hollow needle to form drops, the needle having an internal dimension  
26 selected to provide a desired gel bead size.

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28 14. A method according to claim 10 comprising admixing a temperature-  
29 sensitive active agent with the cooled agar-restraining polymer solution, prior to

1 carrying out step b), whereby the active agent is also incorporated in the gel  
2 beads.

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4 15. A method according to claim 9, comprising admixing an active agent in  
5 step a) whereby the active agent is incorporated in the gel beads.

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7 16. A sunscreen composition comprising an effective quantity of a DNA  
8 repair enzyme incorporated in gel beads formulated with a restraining polymer.

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10 17. A sunscreen composition according to claim 16 further comprising an  
11 ultraviolet filtering material, e.g. finely divided metal oxide such as titanium  
12 dioxide or zinc oxide and a free radical scavenger, e.g. vitamin E.

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14 18. An anti-actinic cosmetic composition for topical application comprising a  
15 filtering agent to screen out undesired radiation and a free-radical scavenger  
16 characterized by further comprising a DNA repair enzyme.

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